JOURNAL

OF THE

AMERICAN CHEMICAL SOCIETY.

VOL. VI.—NOS. 1-2.

JANUARY–FEBRUARY.

1884.

COMMITTEE ON PAPERS AND PUBLICATIONS:

J. H. STEBBINS, JR.,
A. R. LEEDS,
A. A. BRENEMAN, Editor.

ABSTRACTORS:

E. WALLER, O. H. KRAUSE,
J. H. STEBBINS, JR.

CONTENTS:

	Page.
I. A Flashing Test for Gunpowder; by Charles E. Munroe, S. B. (Harv.)	7
II. Spontaneous Decomposition of Explosive Gelatine; by Charles E. Munroe, S. B. (Harv.)	13
III. Benzurelde; by Albert R. Leeds	15
IV. Atomation (second paper). Atomation of Oxygen at Elevated Temperatures, and the Production of Hydrogen Peroxide and Ammonium Nitrite, and the Non-Isolation of Ozone in the Burning of Purified Hydrogen and Hydrocarbons in Purified Air; by Albert R. Leeds	17
Abstracts from Chemical Journals	24
Abstracts of American Patents	50

PUBLISHED MONTHLY.

NEW YORK:
JOHN POLHEMUS,
102 Nassau Street.
1884.

The **Journal of the American Chemical Society** appears monthly, except during July and August. It will contain all papers read before the Society, as well as abstracts from American and Foreign Journals, and a list of American Patents relating to Chemical Industries.

The Price of Subscription is $5.00 per year, in advance.

The Meeting Room and Library of the Society are at Room 1, University Building, Washington Square, New York.

The Regular Monthly Meeting is held on the first Friday of every month, at 8 P. M. A *Conversazione* is held on the third Friday of every month, at the same hour.

Corresponding Secretary:

P. CASAMAJOR, Care of Havemeyer & Elder, Brooklyn, E. D.

Treasurer:

T. O'CONNOR SLOAN, 119 Pearl St., New York.

The Library is open to Members at any time on presenting to the Janitor of the University Building a ticket, which can be obtained of the Librarian.

W. RUPP, 117 Pearl St., New York.

The Committee on Papers and Publications respectfully call attention to the resolutions of the Society, requiring that papers be submitted to the Committee before being read.

Members who cannot be present at the meetings, are requested to send their papers in care of the Committee, who can guarantee prompt publication of all articles accepted.

Authors will be furnished, gratis, with 20 reprints of each article published in the Journal, if application for the same be made when the article is sent.

Members are requested to notify the Committee of any change of address, or failure in the delivery of the Journal. All communications relating to the Journal should be addressed in care of

A. A. BRENEMAN, 97 Water St., New York.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

Annual Meeting, Jan. 4, 1884.

Vice-President A. R. LEEDS in the chair.

The report of the librarian was read.

The report of the curators was also read.

The committee on publications stated that the last number of the Journal for 1883 was in the hands of the printer.

The committee on nominations then reported, and the electionof officers for the ensuing year was then entered upon, and the following gentlemen elected.

President—JAMES C. BOOTH.

Vice-Presidents.

A. R. LEEDS. J. H. APPLETON.
C. A. DOREMUS. F. G. WORMLEY.
E. WALLER. A. B. PRESCOTT.

Corresponding Secretary—P. CASAMAJOR.

Recording Secretary—C. E. MUNSELL.

Treasurer—T. O'C. SLOANE.

Librarian—WILLIAM RUPP.

Curators.

F. C. WIECHMANN. LOUIS S. WARE.
E. F. CRUSE.

Committee on Papers and Publications.

JAS. H. STEBBINS, Jr. A. A. BRENEMAN.

Committee on Nominations.

ARTHUR H. ELLIOTT. J. P. BATTERSHALL,
O. H. KRAUSE. J. B. F. HERRESHOFF.
A. P. HALLOCK.

Board of Directors.

A. R. LEEDS.
C. A. DOREMUS.
E. WALLER.

P. CASAMAJOR. C. F. CHANDLER.
C. E. MUNSELL. H. MORTON.
T. O'C. SLOANE. JAS. H. STEBBINS, JR.
WM. RUPP. WM. M. HABIRSHAW.
M. ALSBERG. H. ENDEMANN.

The meeting then adjourned.

T. S. GLADDING,
Recording Secretary.

Annual Report of the Treasurer of the American Chemical Society for the Year 1883.

Dr.		Cr.	
1883.		1883.	
Jan. 1. To Cash on hand	$133 10	Jan. By Bills paid	$113 57
Jan. To Month's collections	450 02	Feb. " " "	3 75
Feb. " " "	153 00	Mar. " " "	157 70
Mar. " " "	60 00	April. " " "	30 37
April. " " "	10 00	May. " " "	53 02
May. " " "	30 00	June. " " "	197 32
June. " " "	5 00	Oct. " " "	201 07
July. " " "	10 00	Nov. " " "	75 41
Aug. " " "	10 00		
Sept. " " "	5 00		
Oct. " " "	70 00		
Nov. " " "	60 00		
Dec. " " "	35 00	Balance	198 91
	$1,031 12		$1,031 12
1884.			
Jan. 1. To Cash on hand	$198 91	Total expenditures	$832 21

Detailed Statement of Expenditures.

Treasurer's expenses	$34 73
Rent and Janitor's fees and coal	356 75
Gas	8 53
Recording Secretary's expenses	39 50
Journal	373 20
Insurance	6 00
Corresponding Secretary's expenses	11 00
Curator's expenses	2 50
	$832 21

Respectfully submitted,

T. O'CONNOR SLOANE
Treasurer.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING—February 1st, 1884.

Vice-President Leeds in the chair.

The minutes of the January meeting were read. As only twelve members were present, there was no quorum, and eight nominations could not be acted upon.

Mr. Stebbins suggested that Article 8 of the Constitution be amended so that the quorum be reduced from 15 to 10 members, according to Article 10. Mr. Stebbins suggested that the Secretary be requested to notify the Directors that a meeting of the Board be called for Tuesday, February 12th, at 4 P. M., at 117 Pearl Street.

Prof. Breneman spoke of appointing the third member of the Committee on Papers and Publications, and recommended Prof. Leeds as that third member. This was ratified by a unanimous vote.

The Librarian reported the receipt of a work on Explosives by Berthelot from the author.

The following papers were then read:

1. A Flashing Test for Gunpowder, by Prof. C. E. Munroe, of Annapolis, Md.

2. An Instance of the Spontaneous Decomposition of Explosive Gelatine, by Prof. C. E. Munroe.

3. Benzureïde, by Prof. A. R. Leeds.

4. Atomation (second memoir) of Oxygen at Elevated Temperatures, Production of Hydrogen Peroxide and Ammonium Nitrite, and the Nonisolation of Ozone, in the burning of purified Hydrogen and Hydrocarbons in purified Air, by Prof. A. R. Leeds.

The Society then adjourned.

CHARLES E. MUNSELL,
Recording Secretary.

Additions to the Library of the American Chemical Society

During January and February, 1884.

PRESENTED BY THE AUTHORS.

Presented by Mr. Berthelot:

"Sur la Force des Matieres Explosive d'apres la Thermochimie." Troisiéme Edition, 1883, 2 vols.

Presented by J. S. Newberry, Ph. D.:

"The Origin of the Carbonaceous Matter in Bituminous Shales." Pamphlet.

ACQUIRED BY GIFT.

Presented by the Central Meteorological Observatory, Mexico:

"Anales de Ministerio Fomento de la Republica Mexicana." Vol. VII.

Presented by the American Society of Microscopists:

"Micrometry. History of the National Committee." Pamphlets.

Presented by the Geological and Natural History Survey of Canada:

"Geological and Natural History Survey of Canada. Report of Progress for 1880–81–82.

Presented by Messrs. Waring and Williams:

"Chart of Alchemical Notation."

Presented by the Connecticut Agricultural Experiment Station:

"Annual Report of the Connecticut Agricultural Experiment Station for 1883."

ACQUIRED BY EXCHANGE.

With the Bureau of Statistics, Washington, D.C.:

"Quarterly Report of the Bureau of Statistics." No. 1. 1883–84.

"Statistical Abstract of the Reports of the United States." 1883. Sixth number.

"Annual Report of the Chief of the Bureau of Statistics for the fiscal year ending June 30th, 1883."

The following exchanges are regularly received and on file at the rooms of the Society:

AMERICAN.

American Chemical Journal.
American Gas Light Journal.
American Journal of Pharmacy.
American Manufacturer and Iron World.
American Druggist.
Annals of the New York Academy of Sciences.
Anthony's Photographic Bulletin.
Chemical Review.
Deutsch-Amerikanische Apotheker-Zeitung.
Engineering and Mining Journal.
Journal of the Franklin Institute.
Manufacturer and Builder.
Manufacturer's Review and Industrial Record.
New York Medical Journal.
Oil, Paint and Drug Reporter.
Popular Science Monthly.
Proceedings of the Academy of Sciences of Philadelphia.
School of Mines Quarterly.
Transactions of the American Society of Engineers.
Transactions of the New York Academy of Sciences.
Textile Colorist.

ENGLISH.

Chemical News,
Chemical Review.
Engineering.
Journal of the Chemical Society.
Journal of the Society of Arts.
Pharmaceutical Journal and Transactions.

FRENCH.

Annales des Mines.
Moniteur des Produits Chimique et de la Droguerie.
Moniteur de la Teinture.
Repertoire de Pharmacie et Journal de Chimie Medicale.

GERMAN.

Berichte der Deutschen Chemischen Gesellschaft.
Bierbrauer.
Deutsche Gerber Zeitung.
Oesterreichische Zeitschrift fur Berg-umd Huettenwesen.

Polytechnisches Notiz-Blatt.

Sitzungsberichte der. K. K. Akademie der Wissenschaften zu München.

Verhandlungen der K. K. Geologischen Reichsanstalt.

Verhandlungen der Kaiserlichen Akademie der Wissenschaften in Wien.

ITALIAN.

Archivio di Chimica.

Gazetta Chimica Italiana.

MEXICAN.

Boletin de Ministerio de Fomento de la Republica Mexicana.

RUSSIAN.

Pharmaceutische Zeitschrift fur Russland.

A FLASHING TEST FOR GUNPOWDER.

CHAS. E. MUNROE, S. B. (Harv.)

Among the methods in use for the determination of the condition and quality of gunpowder, is the "flashing test." According to the *Ordnance Instructions U. S. Navy, pg.* 345, "about eight drams of powder are poured on a glass plate so as to form a conical heap, and 'flashed' by applying a hot iron; no residuum should be left and only a few smoke marks should be seen on the plate." Capt. Smith, R. A., in his *Handbook of the Manufacture and Proof of Gunpowder, pg.* 83, proceeds in the same way, but he places the powder in a thimble-shaped, copper cylinder "which is then inverted on the flashing plate. This provides for the particles being arranged in pretty nearly the same way each time, which is an all-important point in flashing. The decomposition of the powder will be more thorough if it be thrown together in a conical heap, than if it be spread out in a thin layer on the plate, hence, for comparison of different powders, they should be placed on the plates as nearly as possible under the same conditions.

If the powder has been thoroughly and effectually incorporated the small charge placed on the plate will 'flash' or puff off when touched with a hot iron, leaving only smoke marks on the plate. A badly incorporated powder will, on the other hand, leave specks of undecomposed saltpetre and sulphur, and will therefore give a dirty residue. But the 'flashing' test, though apparently most simple, is one which, like the examination by eye and hand, requires experience to enable the observer to form an accurate judgment. Though a very badly incorporated powder could be detected at once, it is by no means easy to judge between two powders, both tolerably good, as to which has undergone the most thorough incorporation. Flashing should therefore be constantly practised with all classes of powders, and it is useful to keep some samples of bad powders to flash occasionally for comparison. Powder which has once been subjected to and injured by damp will be found to flash very badly, no matter how carefully its incorporation may have been performed. This arises from a partial solution of the saltpetre having taken place, causing a consequent disturbance of the incorporation."

Comdr. J. D. Marvin, U. S. N., in his *Objects and Resources of the Naval Experimental Battery, pg.* 18 repeats the above directions and suggests weighing the plate on which the flash has been made,

but, as he provides no means to prevent the absorption of moisture and oxygen and the escape of the hydrogen and ammonium sulphides, the method is of no value.

In the *Comptes Rendus* 78, 1138 ; 1874, Col. Chabrier proposes, what he terms a *pyrographic* method for the examination of gunpowder and a detailed account is given in the *Revue d' Artillerie* 4, 396 ; 1874, of its application by the *Comité de L'Artillerie* in determining the relative value of wheel mills, stamp mills and *moulins à tonneaux* in effecting incorporation and of the length of time necessary in each case to produce the desired result.

This method consist in flashing the powder on sheets of paper, colered blue with iodide starch. Sheets of uniform tint, 0.30 meter long by 0.15 meters wide, are dampened and placed on a plate of glass of the same size. A half gram of powder is then trailed on the paper, following the longer axis. It is flashed by a red hot, iron wire and it is found that the centre of the blue paper is bleached, while black spots and streaks appear on the white ground and white spots on the blue ground. The size and shape of the bleached space and the number and arrangement of the spots and streaks are determined by the character and amount of the powder used. Col. Chabrier does not give the rationale of his process but it is to be inferred from the fact that he styles these results *pyrographic* images, that he believes the bleaching to be due to the heat evolved by the combustion. The well known experiment of the bleaching of starch paste, colored blue with iodine, by heating in a test tube, is an example of the same kind.

This process is an advance upon the older one but in applying it some years ago I found it difficult to prepare papers of the same degree of blueness and that the evanescent character of the color made it difficult to preserve the test papers intact for any considerabe length of time ; so, as before, we must either practice the method continually or else flash powders, which we have kept as standards for comparison, with each set of tests we make, in order to arrive at any good results. Or, finally, we may photograph the test papers, but this involves considerable labor and the loss of the color.

Since the flashing test is the simplest, readiest, and in the hands of an expert, the best test for the incorporation of powder, and, since it also fairly indicates the amount of deterioration which a powder has undergone during transportation and storage, it has seemed to me desirable to seek some method by which the record could be made permanent. Such a record could then be filed at

the factory with the other data concerning a given powder, or, in the case of the Government, they could be inclosed with the quarterly returns of the inspecting officers at distant stations, to be examined by some expert in the Bureau. Specimens of the tests of standard powders could also be furnished inspecting officers, to guide them in the interpretation of the results of their tests, and finally, a sample of the required test might be attached to the specifications for a gunpowder to be purchased.

After some search I believe that I have secured such a permanent record, by employing a paper colored with Turnbull's Blue, upon which to make my flash. This paper is the same as that used in the "Blue Print Process" of photography, and is easily procured in commerce. The use of the paper was suggested by the following facts. When gunpowder burns, the reaction which takes place may, according to Debus, *Proc. U. S. Naval Institute*, 9, 76, 1883, be represented by the reaction $16\ KNO_3 + 13C + 5S = 3K_2\ CO_3 + 5K_2SO_4 + 9\ CO_2 + CO \times 8\ N_2$.

Since, however, in ordinary gun powders there is more carbon and sulphur than is required by the above equation, secondary, endothermic reactions take place, which may be combined and represented as follows: $3K_2\ SO_4 + 2K_2\ CO_3 + 7C + 7S = 5K_2\ S_2 + 9C\ O_2$.

Further, on exposure to the air, the polysulphides formed are oxidized to thiosulphates. I have observed that, in my experiments, the characteristic smell of the latter was most noticeable when the powder was badly incorporated.

It is well known that solutions of the alkalies and the alkaline carbonates decompose Turnbull's Blue and thereby destroy its color. Advantage has been taken of this reaction to increase the distinctness of "Blue Prints," or to make such additions to them or alterations in them as desired. With this I exhibit a specimen of the blue paper, upon which one of the above reactions is written by the aid of a solution of potassium carbonate. The alkaline sulphides and thiosulphates also act upon the blue paper, but with less intensity and with the partial production of a yellow color. By flashing gunpowder then, upon such paper, yellow and white spots will be formed through the action of the substances formed by the reaction.

The test is made as follows: Pieces of the paper, from 15 to 20 centimetres square, are dampened and placed on a sheet of glass or copper. A truncated leaden cone 3 centimetres in capacity is closed

with the finger at the smaller end, filled evenly with powder and inverted on the paper. The result is a conical heap. The heap is immediately fired, either by a hot iron or copper wire, or, as in my experiments, by a fina platinum wire, heated to incandescence by an electric current. The paper is exposed to the action of the residue for thirty seconds and then immediately placed under the spigot and washed with running water. When pulverized gunpowder cake is used it will be found that the space described by the base of the cone, has been blackened and partially bleached by the dampened layers of powder in contact with it; that about this space are black smutches and streaks, and that the whole surface of the paper is marked by white and yellow dots. Where the powder is badly incorporated the spots are coarse, and irregular in shape and distribution; where the incorporation is complete, the spots are fine and quite uniformly distributed over the surface so that the paper appears but of a paler blue, with occasional spots and few streaks.

With this, I forward specimens of tests made with powdered "mill cake." All of the specimens belong to the same "charge," but the first was drawn after the mill had been running four hours; the second, at the end of eight hours; the third, after twelve hours; and the fourth, after sixteen hours. The latter is known as the "finished composition." This length of running is rather unusual, but the charge used at the mills is greater than common. The tests exhibited were made October 19, 1883. I have yet others made April 26, 1883, which are to-day apparently as fresh and distinct as when made. It is believed that the papers show what is described above. That importance is given, in interpreting the results, to uniformity of the bleaching and in the arrangement of the spots, depends upon the fact that gunpowder is a mechanical mixture, and, therefore, that the regularity of the combustion and the uniformity of the accompanying reactions must depend upon the fineness of the ingredients and the intimacy and uniformity of the mixture. If the ingredients are coarse, and the mixture imperfect, the combustion will go on slowly and irregularly, and the resulting globules of residue will be of considerable size and be deposited near the centre of action. If the incorporation is complete, the reaction will take place nearly simultaneously throughout the whole mass, and the globules will be, as a rule, quite small and projected to some distance. This interpretation is for mealed powders having the same formula. I have not yet been able,

personally, to extend my experiments to granulated powders or powders of varying proportions and ingredients, but I believe that this test will form a useful method for the study of these powders.

In order that the indications may be interpreted aright, it is necessary that the conditions, under which the experiments are made, shall be as nearly uniform as possible, and the first of these is that the color of the test paper should be in all cases as nearly as possible of the same depth. The paper may be purchased in an emergency but it varies among manufacturers owing to the many different formulas according to which it is made. Among these I have selected that issued by the Penn. R. R. Co. for use among its operatives.

"Take 10 oz. (283.5 c. c.) of clean water and put in an opaque bottle, add 1¼ oz. (35. 44 grms), of Red Prussiate of Potash, allow this to dissolve. In a second vessel containing 6 oz. (170. 1 c. c.) of water put 2½ oz. (70. 88 grms), of Ammonio-citrate of Iron, allowing this also to dissolve. Add the second liquid to the first and shake thoroughly. Keep closely stoppered and not exposed to light."

"In a room, from which daylight is excluded, but where lamp or gas light may be used, the paper to be printed on, is laid on a table, and the fluid applied with a *clean* sponge. Care should be taken to apply the fluid as evenly as possible, and every part of one side should be gone over. For that reason it would be well to sponge the paper, first in one direction, and afterwards crosswise to the first. When a sheet is sensitized it is put away in a drawer to dry, but never place one sheet on the top of another before they are dry ; afterward it makes no difference. Sensitized paper may be kept in a drawer for a week or more, without injuring its sensitive quality."

"In using the fluid, care should be taken to pour out no more than is needed for the time, as it would be apt to spoil the fluid in the bottle if any fluid which had been used, was poured back again. For the same reason the saucer into which the fluid is poured, and the sponge with which it is applied, should be washed out immediately after using and also before using."

For the purposes of this test for gunpowder the dry sheets are now exposed to strong sunlight for four or five hours. When about to use, immerse in running water for five minutes, lay on the

plate of glass and remove the excess of moisture by aid of filter paper or a blotter. The paper must be thoroughly moistened but without "standing" moisture.

Since writing the above I have received from Lt. Commander W. M. Folger, U. S. N., commanding the Naval Experimental Battery, the following statement concerning the testing of a granulated powder by this method.

"In firing a sample of experimental powder lately, I had reason to believe, from its performance in the gun, (calibre 6"), that the powder was badly incorporated. Tested in the manner you suggested with Turnbull's paper and following all your directions, indications were furnished which (when compared with results obtained with a normal sample of approved powder) verified most definitely the value of the method you suggest."

SPONTANEOUS DECOMPOSITION OF EXPLOSIVE GELATINE.

CHARLES E. MUNROE, S. B. (HARV.)

Several instances of the decomposition of explosive gelatine on keeping or after long exposure to moderate temperatures, have been reported, but I have yet met with but one of these cases in which the products of the decomposition have been stated. Gen. H. L. Abbot, in a prefatory note to Addendum I, Report on Submarine Mines, states that "all the samples of the explosive gelatine remaining on hand after the trials detailed in the Report, have undergone spontaneous decomposition, separating into cellulose and free nitro-glycerine with the copious evolutions of nitrous fumes. This change occurred during the winter and spring of the current year (1881–1882), and was not caused by any exposure to high temperatures while in store."

A case of spontaneous decomposition of a small amount stored freely exposed to the air, in a room of fairly even temperature and dryness, has occurred under my own observation. The camphorated explosive gelatine was wrapped in paraffine paper, and then in light brown Manilla paper, and laid on the shelf. After something more than one year's exposure it was found, in the early winter, to be giving off nitrous fumes (which had stained and attacked the wrapping paper), and to have shrunk considerably in volume, while the outside of the paper was covered with congeries of fine crystals. The odor of camphor was still quite strong. The mass was immediately put into a vessel of water. It was found to be friable, and, after a short immersion, disintegrated. The camphor odor soon disappeared, and the water became of a straw color, gave a strong acid reaction, and showed traces of nitrous acid, but no nitric acid. On evaporation of the filtered liquid, oxalic acid crystallized out in quantity, and on evaporation of the "mother liquor" on the water bath, a sugar-like mass was obtained, which gave the glucose reaction with Fehling's solution. The paraffine was regained unchanged, and the paper was recovered, but in a flocculent condition, and with the color bleached from the brown. Careful search failed to reveal the presence of glycerine, nitro-glycerine, or gun-cotton. The cellulose from the gun-cotton could not well be detected (if it existed) in the presence of so much flocculent cellulose from the paper. In reporting these observations I am not unmindful of the fact that some changes may have taken place during immersion, but it can easily be understood why I preferred it in that position.

The results obtained by de Luca in his "Researches on the Spontaneous Decomposition of Gun-Cotton," *Comptes Rendus* 59,487, *Sept.* 12, 1847, are interesting in this connection. Gun-cotton decomposes most rapidly when heated to 50° on a water bath, next by direct sunlight, more slowly by diffused light, and very slowly in darkness. The gun-cotton first shrinks to one-tenth of its original volnme, next it begins to become gum-like and sticky, then it swells; during all these phases it gives off nitrous fumes, but especially during the last. For the fourth phase the gas ceases to be evolved, and the mass becomes brittle, and of a light color like sugar. The products are nitrous compounds, with formic and acetic acids in the state of a gas, and an amorphous, porous, sugar-like body, almost entirely soluble in water, and containing an abundance of glucose, gummy matter, oxalic acid, a small quantity of formic acid, and a new acid of which he obtained the lead and silver salts for later examination. From 100 grains of gun-cotton he obtained about 14 grains of glucose.

In discussing the stability of nitro-glycerine (which is the other component of explosive gelatine), A. Brull, in *Etudes sur la Nitroglycérine et la Dynamite, fig.* 26, 1875, says: "Nitro-glycerine which retains traces of acid is not stable. In general the decomposition is extremely slow and tranquil. It disengages at first nitrous fumes, and the liquid takes a greenish color; then it generates nitrogen protoxide, carbon dioxide and crystals of oxalic acid, and after some months the entire mass is found to be converted into a greenish, gelatinous mass, composed of oxalic acid, water, and ammonia. Sometimes, if the temperature is quite high—if for example, the nitro-glycerine is heated by the sun, the decomposition is more active. Very rarely it causes an explosion."

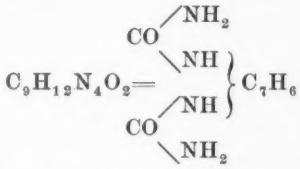
The source of difficulty, then, seems to be in the presence of free acid, and this will probably be found in the gun-cotton used, for it is difficult to purify soluble gun-cotton completely.

BENZUREÏDE.

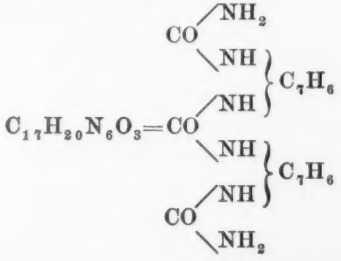
By Albert R. Leeds.

In the Ann. Chem. Pharm., vol. 151, p. 192, Schiff describes the products obtained by the action of Benzaldehyde on Urea. I have had occasion to repeat this work, and have obtained the following results.

Two molecules of urea were dissolved in alcohol and added to one molecule of benzaldehyde. Sufficient alcohol was added to dissolve the urea in the cold, and the flask containing the solution was allowed to stand, loosely plugged with cotton wool, for several weeks. Minute, crystalline needles were slowly deposited. They were purified by washing with ether and dried over sulphuric acid. They yielded on analysis C 52.04 p. ct. and H 5.85 p. ct. (theoretical C 51.92 p. ct., H 5.77 p. ct.), and proved to be the Benzodiureïde of Schiff.



Urea and benzaldehyde, dissolved in alcohol in the cold, were added together in the proportion of three molecules of urea and two molecules of benzaldehyde. The solution was heated in a flask connected with a return cooler for a number of days upon a water bath. Most of the alcohol was finally expelled, when the compound crystallized out in very brilliant, white needles. After purification by washing with ether they gave, on analysis, the formula of dibenzotriureïde, C 56.46 p. ct., H 6.00 p. ct. (theoretical C 56.66 p. ct., H 5.88 p. ct., or



Deeming it probable that the simplest form of combination between urea and benzaldehyde or benzureïde might be found by varying the conditions of the reaction, the experiment was tried of introducing the two substances, dissolved in absolute alcohol and in molecular proportions, into a sealed tube. This was heated for 48 hours at a temperature of 95°, at the expiration of which time an abundant porcelain-like, white deposit had formed. No pressure was noted on opening the tube. Its contents, after purification, were found to consist of fine, white, crystalline needles. On analysis they gave C 56.56 p. ct. and H 6.18 p. ct., showing that the substance thus formed was not benzureïde but dibenzotriureïde. It does not melt, but begins to decompose and give off a crystalline sublimate at 200°.

The dibenzotriureïde was described by Schiff as a compact, crystalline mass, in which no especial form could be recognized, and for which he gives no melting point or analysis.

ATOMATION (2d PAPER). ATOMATION OF OXYGEN AT ELEVATED TEMPERATURES, AND THE PRODUCTION OF HYDROGEN PEROXIDE AND AMMONIUM NITRITE, AND THE NON-ISOLATION OF OZONE, IN THE BURNING OF PURIFIED HYDROGEN AND HYDROCARBONS, IN PURIFIED AIR.

By Albert R. Leeds.

It has heretofore been established, by the fact of the conversion of carbon monoxide into dioxide during the slow oxidation of phosphorus, that the formation of ozone, hydrogen peroxide and ammonium nitrite, in the course of this eremacausis, is preceded by the resolution of the oxygen molecule into its constituent atoms. The converse of this proposition, viz.: That when oxidation occurs with the contemporaneous formation of the three products enumerated, this oxidation has been preceded by the production of atomic oxygen, has not as yet been satisfactorily established, and awaits experimental proof.

The object of this second paper is to present the conflicting testimony as to whether these three bodies are formed during the rapid combustion of hydrogenous substances, and the results of a new experimental inquiry.

According to Schönbein, the formation of ozone occurred in all cases of slow oxidation in presence of atmospheric air. Moreover, that when readily oxidizable metals, like zinc and iron, were agitated in contact with air and water, hydrogen peroxide was formed. Also, that ozone, in presence of air and moisture, would generate ammonium nitrite.

This last statement, after long controversy, has been satisfactorily disproven by Carius.* Satisfactorily, because Berthelot† working independently and at a later period, has entirely confirmed the results obtained by Carius. It has thus been established beyond reasonable doubt, that ozone in presence of moist atmospheric air or moist nitrogen will generate neither ammonium nitrite or nitrate.

At the same time it is no less certain that in the slow oxidation of phosphorus, the contemporaneous formation of ammonium nitrite, ozone and hydrogen peroxide takes place. And whilst the observations of Schönbein and others, as to the occurrence of the same

*Ann. der Chem. CLXXIV, 31.
†Compt. Rend. LXXXIV, 61.

phenomena in the course of the slow oxidation of metals, have not been reinvestigated with the same minuteness as the oxidation of phosphorus, yet it is eminently probable that the correctness of his labors in these particulars will be eventually vindicated. In this connection, the recent controversy and final establishment of the fact of the production of both hydrogen peroxide and ammonium nitrite, when the hydrogen in palladium hydrogen undergoes slow oxidation in presence of air and moisture is very instructive.

After the researches of Marignac, Andrews, Soret, Brodie and others, had elucidated the true nature of ozone, a very different interpretation was put upon many of the experimental results obtained by Schönbein, from that put forth by their original observer. Instead of regarding, as Schönbein did, ozone or the fictitious antozone, as the starting point in certain sequences of phenomena, the hypothesis was advanced in various quarters, that the real starting point was an initial change in the oxygen molecule, necessarily antecedent to all the observed phenomena.

In any new investigation of this topic it is but just to previous observers to rehearse the history of their labors, and in so doing the difficulties encountered are of two kinds: 1st. To ascertain in regard to particular experiments whether the reactions noted were in reality due to their ascribed causes. 2d. To restate the thoretical explanation of these phenomena in the light of the present universally received doctrines concerning the true nature of ozone.

One of the earliest observations, relating to the subject matter of the present paper, was that contained in a brief communication made to the Lyceum of Natural History of New York in 1869, by Loew.* His experiment was of a very simple nature. He blew a strong current of air through a fine tube into the flame of a Bunsen's burner, and collected the air in a beaker glass or balloon. He stated that in the course of a few seconds, sufficient ozone could be collected in this manner to be identified by its intense odor and the common tests.

Subsequently, a large apparatus containing many jets and burners, was patented by Loew and applied to the mellowing of whiskies by means of the "ozone" thus formed.†

The production of ozone in the manner described, was immediately denied by Boeke, who substituted a blast of oxygen for the

*Chem. News, XXII, 13.

†Wagner's Jahresb. 1874, p. 404; Dingl. polyt. Jour. CCXIII, 306.

air expired from the lungs, and obtained from the gaseous products the reactions and odor of a compound of nitrogen and oxygen.*

Böttger likewise denied the accuracy of Loew's results, but upou altogether different grounds.† He detected no ozone in air blown through the flame of a Bunsen burner, but ammonium carbonate (which he regarded as a regular constituent of air expired from the lungs), and hydrogen peroxide. In reply to these criticisms Loew repeated his experiments, using instead of expired air, a bellows and a large Bunsen burner, and stated that in this manner he filled, in a short time, a large room with the peculiar odor due to ozone, while delicate tests failed to detect any peroxide of hydrogen or ammonium carbonate.

Similar experiments were performed by Than.‡ This observer aspirated the products of combustion from the lower edge of the flame of a Bunsen burner through an acidulated solution of potassium iodide and starch. A blue coloration was speedily produced, the air in the wash-bottle smelling distinctly of ozone. When pure water was used as an absorbing solution and subsequently tested with potassium iodide and starch, no blue color was developed. From this negative result the absence of ammonium nitrite was inferred, and from the previous affirmative result the presence of ozone. But the formation of ammonium nitrite as a product of combustion of hydrogen has since that time been established beyond doubt, whilst the reactions for ozone obtained by Than permit of other explanations.

Similar objections apply to the experiments performed by Struve (1871),§ who endeavored to prove that ozone, hydrogen peroxide, and ammonium nitrite are all present in the products of combustion of hydrogen. The gas was burned beneath a long drawn-out funnel, and tests were made for ozone at the upper end of the funnel, whilst the water condensed on its sides was collected and examined for hydrogen peroxide and ammonium nitrite.

In Poggendorff's Annalen for 1872 (p. 480), a summary is given of the results obtained by Pincus upon the formation of ozone, when thoroughly purified hydrogen gas was burned in atmospheric air. The gas was burnt with the smallest possible lens-shaped flame from a metal jet. According to Pincus, when a cold and clean

*Chem. News, XXII, 24.
†Chem. Centr. 1870, p. 161.
‡J. pr. Chem. [2] I, 415.
§Zeitsch. anal. Chem, X, 292.

beaker glass was held over the flame the contents of the beaker possessed as powerful an odor of ozone as the interior of a charged Leyden jar. When pure oxygen was substituted for atmospheric air in a properly constructed apparatus, the same phenomena occurred, showing that the nitrogen of the air was not essential to its development.

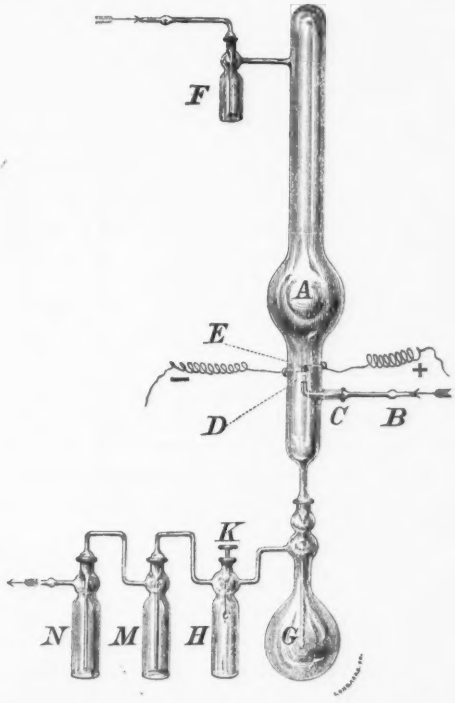
The merit of having established, by rigorous experimental proof, the formation of ammonium nitrite by the burning of hydrogen thoroughly purified in thoroughly purified air, is due to Zoeller and Grete.† In their apparatus the air and hydrogen were purified by passage through potassium permanganate, potash, sulphuric acid, and Nessler's reagent, and the absence of both nitrous acid and ammonia in the gases prior to combustion, most carefully demonstrated. The hydrogen was burnt in a jet 3 to 4 m.m. high issuing from a platinum blowpipe tip. The ammonia formed by combustion was converted into ammonio-platinum chloride, the nitrous acid was identified by diamido-benzole and other tests. Nitric acid was sought for, but no reaction for it was obtained. The authors make no mention of either ozone or hydrogen peroxide.

In entering upon the present investigation of this difficult topic, it was with the hope of constructing an apparatus in which, by the use of completely purified gases, and the elimination of all surfaces of contact with organic bodies, it would be possible to decide whether at one and the same time, ozone, hydrogen peroxide, and ammonium nitrite (and possibly nitrate) were formed in process of combustion of hydrogenous substances.

The apparatus employed is figured in the accompanying cut. The combustion chamber A consists of a tall glass cylinder 80 c.m. in height and 6 c.m. in diameter, with a globular enlargement. At the bottom it connects, by a tube passing through a stopper of ground glass, with the receiving vessel G. This vessel communicated with the bottle H, whose stopper K is provided with a platinum hook fused in to its lowest part. H communicates with the wash-flasks M and N, by tubes passing through their mouths and ground into them air-tight. The entrance-tube B passes through the ground glass joint C, and is fused to the platinum jet D. Platinum wires connected with a coil are twisted into a very small spiral E, which is interrupted so as to allow of the passage of a spark immediately above the jet. At the upper portion of the

†Ber. Bericht. X, 2144.

chamber A there is a lateral tube connected with a wash-flask F, which is provided with an entrance-tube passing through its stopper of ground glass.



In the performance of the experiments, the air, after passage through a long tube filled with ignited asbestus, was passed through water, potassium permanganate, potash, sulphuric acid, and Nessler's reagent, entering at the upper end of the combustion chamber by the wash-flask F. It encountered the hydrogen similarly purified at E, and combustion was brought about by passage of the spark at this point. The platinum spiral was made very small so as to be contained within the outer surface of the flame. This was done to obviate the possible error due to the contact of platinum at high temperatures with the mixed gases. At the same time some device of this character was necessary, since the perfectly

purified hydrogen gave an invisible flame and it could not be certainly known, except by the incandescence of the platinum, whether the flame had gone out or not. Without the platinum, extinction of the flame was very apt to occur, but with the platinum this never happened. The products of combustion flowed down into G, in which vessel and in H and M they were entirely condensed, these vessels being kept cold by ice. N contained a solution of potassium iodide, free from iodate and other impurities.

On opening the apparatus, in none of the trials was the odor of ozone noted. The potassium iodide alone, or after addition of starch water, was never affected when pure hydrogen was burned. When illuminating gas was used, the potassium iodide solution gave no indications of decomposition by ozone, on application of tests. If starch was added to it, a faint reddish precipitate was formed. On filtering off this precipitate, washing thoroughly with water, and allowing it to remain in contact with air, it became violet in color. Unfortunately the amount was so small that the nature of this yellow precipitate could not be determined with certainty. Aldehyde, passed into a solution of potassium-iodide starch, yielded a yellow precipitate, turning first violet and then blue on exposure to air. But these experiments are apart from the main purpose of the investigation, and the deportment of potassium iodide alone or with starch, sufficiently established the fact that no ozone passed through the wash bottle N.

The condensed water gave an intense reaction with the Griess's tests. When pure hydrogen was used the percentage of nitrous acid was 0.005 parts in 100,000, that of ammonia 0.002 parts per 100,000. These quantities are in the proportion corresponding to ammonium nitrite. The amount of hydrogen peroxide much exceeded that of ammonium nitrite, being 17 parts per 100,000. The various tests for hydrogen peroxide in which potassium iodide enters as one of the constituents, were not relied upon as conclusive, since the results obtained might have been due to other substances possibly present. But the condensed water gave in addition an intense blue color with fresh cold extract of malt and fresh guaiacum tincture. Moreover, it developed with solution of chromic acid a strong blue color, the last being regarded as the most satisfactory of the tests applied to prove qualitatively the presence of hydrogen peroxide. No nitric acid was detected.

The amounts of nitrous acid, ammonia, and hydrogen peroxide obtained when purified illuminating gas was burned, were not de-

termined, but the qualitative tests applied to establish their presence were the same as those used in the case of pure hydrogen, and were equally satisfactory.

It should be observed that an apparatus of the character described is not well adapted to settle the question of the possible formation of ozone. The products of the combustion could not be rapidly withdrawn from the influence of the elevated temperatures in the immediate vicinity of the flame, and any ozone formed could readily have undergone decomposition. The experiment is a failure, in so far as its bearing upon the validity of the observations made by preceding observers is concerned. In all of their experiments the immediate withdrawal of the products of combustion is an essential feature. In repeating their experiments, if other evidence than that afforded by the powerful odor of ozone is sought for, it would be necessary to obtain the absorption spectrum of ozone and the blackening of silver. Under the conditions of the experiment, other qualitative tests for the presence of ozone would be open to question. The amount of ozone necessary to yield these decisive proofs however is much greater than that which could possibly be obtained in any trial where all the essential precautions are observed. For these reasons further experiments are abandoned.

The final conclusion reached is the *certain formation* of hydrogen peroxide and ammonium nitrite, and, in view of the fact that the statements of others concerning the presence of ozone have not been disproven, the *possible formation* of ozone.

ABSTRACTS.

Journal of the Society of Chemical Industry. Vol. II., p. 488. December 20th, 1883. London Section.

On a New Residual Product from Coal Gas. H. L. GREVILLE

The product under consideration is carbon disulphide. Incidentally the process of purifying gas at the Commercial Gas Works, where the experiments were made is described. Lime is used to remove the CO_2 and iron oxide to remove the H_2S. To remove the CS_2, of which there are about 30 or 48 grains in the 100 feet of crude gas, purifiers are used containing lime through which gas has been passed containing H_2S but no CO_2. When saturated, the lime has a bright orange-red color. By distilling this lime with water CS_2 was obtained, amounting to between 1 and 2 per cent. on the amount of substance taken. Picked specimens yielded 3 to 4 per cent. The lime remaining in the retort is suitable for re-charging the lime purifiers. The author proposes to use the CS_2 to extract the sulphur from the iron oxide. Since the authorities on the subject say that boiling sulpho-carbonates with water yields H_2S and not CS_2, it is surmised that the orange-red compound obtained is something other than calcium sulpho-carbonate. The author is engaged in an investigation of the subject.

In analyzing the material it is distilled with lead acetate, the CS_2 in the distillate being converted into xanthate by being caught in solution of alcoholic potash. This product is then oxidized by potassium permanganate, the excess of permanganate destroyed by oxalic acid, and the sulphur determined as barium sulphate. In weighing out portions of crude CS_2 for analysis the method of weighing an alcoholic solution of potash in a flask, dropping in the CS_2 and weighing again, was found to be the most satisfactory plan.

In the discussion which followed, Mr. S. H. Johnson stated that when the price of sulphur was £4 per ton or less, it would not pay to extract the sulphur from the spent oxide of the purifiers.

E. W.

Note on the Stassfurt Potash Industry. (P. 492.) C. N. HAKE.

By agreement between the owners of the Stassfurt mines, the daily out-put of Carnallite is to be limited to 3,000 tons daily, sup-

plied by five companies. In July two other mines will participate in the production. No limit has been as yet placed on the out-put of Kainite. E. W.

Liquid Carbonic Acid Under Regulated Pressure. (P. 493.) A. ZIMMERMANN.

A cylinder containing 10 litres of liquid carbonic acid under 36 atmospheres pressure was exhibited, and the construction of the cylinder described. The use of the gas evolved from the cylinder for cleaning beer, and at the same time giving it a sparkle, was practically illustrated. E. W.

LIVERPOOL SECTION.

Analytical Examination of Tars Recovered in the Coking of Coal by the Jameson and the Simon Carve's Processes, and in the Condensation of the Fuel Gases from Blast Furnaces by the Alexander and McCosh Process. (P. 495.) W. SMITH.

To prepare the samples for fractional distillation, the tars were kept for several hours in vessels surrounded by warm water, and as much as possible of the water separating, decanted off. After placing about 2½ litres of the tar in a retort, the temperature is brought to 60 or 70° C. and kept there for some time, a slow current of air being passed through the tar in order still further to remove the water. After the removal of the water in this way, the distillation may be conducted without danger of frothing.

The table of comparisons of the different yields on distillation of the tars is as follows in percentages:

Temperature C.	Jameson Oven No. 2.	Coke ovens, Oven No 3.	Blast Furnace.	Simon Carve's.
Below 150	0.8	1.1	4.2	6.7
230	9.2	22.9		
300	36.0	37.7	10.	19.8
350	6.7	10.5	18.8	36.5
400	19.0	13.8		
About 400° and upwards.	15.3	8.9	24.1	

The crude phenols from the blast furnaces contain more carbolic acid and cresols, than those from the Jameson coke ovens.

E. W.

The Patent Law as Amended in 1883. (P. 501..) W. P. Thompson. MANCHESTER SECTION. E. W.

On Gaseous Fuel. (P. 504.) L. T. WRIGHT.

The percentage value of the different products to gas companies is thus stated :

	Gas.	Coke.	Tar.	Ammonia.	Sundries.
Nottingham, 1881 and 1882,	75.06	8.29	8.21	3.27	5.17
South Metropolitan, 1883,	72.05	15.18	5.34	7.04	.39
Gaslight and Coke Co. 1883,	78.47	11.43	2.98	6.86	.26
Compagnie Parisienne, 1881,	70.70	18.00	3.41	1.91	6.00

The store of heat in the gas is about 17 per cent. of that in the coal. The following is a summary of the results calculated on the cost of to a consumer of different materials which might be offered as fuels:

Fuel.	Cost.	Average Caloric (Kilo-cent.)	Cost per million Calories. £.	s.	d.
Coal,	22s. per ton,	8,300 per kilo.		6	6
Coal gas, 16 candle,	3s. 1,000,	5,555 per cu. metre,	1	0	9½
Water gas,	1s. 10d. p'r 1,000,	2,826 " " "	1	5	0
Generator gas,	1s. 10d. " "	950 " " "	3	14	2

The "generator" gas is such as may be produced by passing air over heated coke, the gas being assumed to have the theoretical composition of CO 34.3 % N 65.7 %.

Theoretically this would yield 1048 calories per cubic metre, but for the purposes of calculation it is assumed that it would yield about 950 cal. E. W.

NEWCASTLE SECTION.

On the Titration of Sulphurous Acid and its Salts. (P. 513.) G. LUNGE.

In confirmation of Thompson's results it was found that Na_2SO_3 imparts a neutral tint in solution to phenolphthalein and rosolic acid, but that with litmus, phenacetolin and methyl orange the neutral point is obtained when $NaHSO_3$ is present in a solution. The color-changes with methyl orange are very sharply marked, while they are indistinct with litmus and phenacetolin.

E. W.

On the Action of Soda, Lime and Magnesia on the Salts of Ammonia and Organic Amines, and on the Titration of Aniline. (P. 514.) G. LUNGE.

Account of experiments with a view to determine which of the three—Na OH, CaO or MgO were best suited for the expulsion of ammonia by distillation in analytical operations. It was found that either might be used if an excess were employed and if the distillation were kept up for at least three hours. In distilling with an excess of ammonium chloride, CaO and NaOH liberated their full equivalent of NH_3, while MgO liberated only about 85 per cent. of its equivalent. Salts of volatile fatty or aromatic amines (ethylamine or aniline) acted in the same manner as the ammonia salts.

The acid in neutral aniline salts can be titrated with normal potash solution, using phenolphthalein as an indicator, just as if the aniline were not present. With methyl orange, however, the neutral aniline salts give a neutral reaction, and the aniline itself shows the reaction of a base. The change of color is not very sharp after 92 to 94 per cent. of the amount of acid required by theory has been added. The use of alcohol of over 25 per cent. strength for dissolving the aniline renders the color-change still slower, and with pure alcohol there is no change of color at all. In titrating with toluidin, the change of color was very slow, though with paratoluidin it was very sharp. Quinoline gives a pretty sharp change of color also, E. W.

BIRMINGHAM AND MIDLAND SECTION.

The Distillation of Coal and Recovery of Hydrocarbons from the Gas. (P. 515.) G. E. DAVIS.

An interesting history of the progress of gas manufacture in England is first given. In connection with the utilization of the ammonia it is noted that low temperatures on the retorts increase the yield of ammonia. The author proposes to use two towers, or in some cases three, in which the ammonia may be absorbed by sulphurous acid in the proportion suitable for the production of bisulphite under the pressure of air, and evaporating the liquor by the waste heat of the retorts, by which means ammonium sulphate is obtained.

The hydrocarbon oils (crude benzol) it is proposed to extract by passing the gas through the "yellow oil" of the tar distiller—the fraction between the creosote and anthracene oil—keeping the oil

at a temperature of about 40° F. The liquid hydrocarbons are then obtained by steaming the oil. In the author's experiments about 4¼ gallons of crude benzol were obtained from the gas from a ton of coal. The results of a fractional distillation of the product are given in detail.

It is observed that until 1876 benzol was not recognized as a constituent of coal gas.

In the discussion that followed, Prof. Tilden remarked that over twenty years ago he had seen a process, intended to demonstrate the presence of benzol in coal gas. The gas was passed through strong nitric acid, and nitro or binitro-benzine thus obtained. E. W.

On the Oxidation of the Sulphur Compounds Occurring in the Manufacture of Caustic Soda. (P. 525.) G. LUNGE and J. H. SMITH.

The results of numerous laboratory experiments in the use of nitrites and nitrates are given together with equations, followed by a short criticism of the conclusions of other experimenters on the subject.

The conclusions are given as follows:

1. Under no circumstance is *nitrate* reduced directly to a lower form than that of nitrite.

2. *Nitrate* in its reduction to nitrite, is capable of oxidizing sulphide to sulphite, and sulphite to sulphate, from about 140° C.

3. *Nitrite* oxidizes sulphide to sulphite, chiefly with reduction to ammonia, at temperatures from about 200° C. At very high temperatures, exceeding 360° C, it oxidizes sulphite, chiefly with reduction to nitrogen.

4. Neither *nitrate nor nitrite* has any action whatever upon this sulphate as such, *i. e.*, before it is split up, but they oxidize the sulphite and sulphide, into which it is split up, exactly as they would the individuals under the same conditions.

5. The presence of iron, in every case, hastens but does not alter the results of the action. The following equations represent all the possible cases of the action of nitrate and nitrite on the sulphide, sulphite, and thiosulphate, both in the presence and absence of iron. About 10 per cent. may be taken as the proportion of total sulphur oxidized according to the secondary equations:

I. From 140° with iron from 120°?

$$Na_2S + 3KNO_3 = Na_2SO_3 + 3KNO_2$$

II. KNO_3 remains.
From 140° with iron from 120°?
$Na_2SO_3 + KNO_3 = Na_2SO_4 + KNO_2$.
Na_2SO_3 remains. See IV.

III. Na_2S remains.
From 200° with iron from 140°?
(a) Primary, $Na_2S + KNO_2 + 2H_2O = Na_2SO_3 + NH_3 + KHO$.
(b) Secondary, 10%. $Na_2S + 2KNO_2 + H_2O = Na_2SO_3 + N_2 + 2KHO$
Na_2S remains; add KNO_2. See I.
KNO_2 remains. See IV.

IV. Neither KNO_3 nor Na_2S remains
After 360°? With iron; before 360°.
(a) Primary, $3\,Na_2SO_3 + 2KNO_2 + H_2O = 3Na_2SO_4 + N_2 + 2\,KHO$.
(b) Secondary, (10%) $3\,Na_2SO_3 + KNO_2 + 2H_2O = 3\,Na_2SO_4 + NH_3 + KHO$.
Na_2SO_3 remains; add KNO_3. See II.

E. W.

On the Cause of the Diminishing Flame in Lamps Fed with Inferior Kerosene. (P. 536.) T. NAKAMURA.

It was observed that much of the "kerosene" imported to Japan from the United States gave a fairly good light with a fresh wick, but the light obtainable after a time diminished, and no scraping of the wick would improve it. The investigation was undertaken to discover the cause, if possible. A fractional distillation of three different brands of the "kerosene" showed that these kerosenes contained large proportions of heavy oils, about 75 per cent. of the samples distilling at temperatures above 200° C.; Sp. Gr. 0.70 to 0.796; flashing points 74 to 77° F. The residues in the retorts yielded much paraffine and vaseline. The fraction of the distillate coming off between 180° and 280° C was turbid, and on standing an acid, aqueous liquid separated. The presence of water in the wick was suspected to be one of the chief causes of the loss of illuminating power of the oil. This was proved to be the case, for on drying, the wick, it was found to give a light of the original intensity.

E. W.

Journal of the Society of Chemical Industry. (Vol. III. No. 1. January, 1884.)

London Section.

Discussion on the Desirability of Uniform Methods and Bases of Analysis, and the Practicability of Establishing an International Agreement Concerning them. (P. 2.)

Some of the points made in this interesting discussion were as follows:

It would be objectionable to reduce chemical analysis to a purely mechanical operation.

Many chemists regard their methods of analysis as their capital, and accordingly refuse to communicate them.

Some also will refuse to follow certain prescribed methods on the ground that they are competent to judge for themselves.

A modification of a prescribed method, e. g., a little more or a little less acid, where the use of it is prescribed, may give a high or a low result.

Rules cannot be laid down to meet every case. In this connection the variable results for Manganese, in some Spanish iron ores, was quoted. The ores were found to contain Ti and Ba, which, in some cases, had been partially or entirely weighed with the iron and in other cases not.

Truthful reports are not always desired by the client. In some cases the reports are known not to be truthful, but conventional, as in the case of soda, where the molecular weight of NaO (old system) was taken as 32 in 1836, and is still adhered to; the difference being about 1% in favor of the manufacturers. The Cornish copper assay, which may be in error to the extent of 2%, was also quoted. A dealer in articles, bought and sold by analysis, stated that the dealers and manufacturers adapted themselves to such conventionalities with regard to the tests, and regulated their business accordingly so that the variation between the chemists' reports and the facts, did not make so much difference as it might seem.

Sir F. Able advocated the adoption of a decimal system in commerce as a step toward uniformity in estimating the commercial value of various articles. On this point he was opposed by Sir F. Bramwell, an engineer, who claimed that the use of a decimal system made people incapable of mental arithmetic.

It was finally resolved to recommend to the General Council the appointment of a committee to determine in what cases, if any, it is desirable to obtain such international agreement. E. W.

Liverpool Section.

Results of the Examination of the Tar from Sutherland's Gas Producers. W. Smith. (P. 9.) The Sp. Gr. of the tar was 1,085.

The result of the first distillation of 2.5 litres afforded (by weight) oils 36.9%, coke 30.5%, water and loss 32.6%.

The oils were again fractioned, the fractions treated with soda and sulphuric acid, and again fractioned; in each case the distillates, which solidified on cooling, were set aside for determing paraffine. The largest yield was of oils distilling at 230°–250°, at 250°–300° and of paraffine, the latter in proportion to of 6.7 per cent. on the tar. No naphthalene was obtained. E. W.

Discussion of M. W. P. Thompson's Paper on the New Patent Law. (P. 11.)

Manchester Section.

Gas Making by Coopers' Lime Process, with Notes on a Method of Gas Analysis for use in Gas Works. J. A. Wanklyn. (P. 12.)

For testing the gas, it is proposed to use a bottle, having a capacity of one-tenth of a cubic foot, fitted with a hollow stopper in which the solution of the reagent may be placed.

The bottle is inverted, filled with the gas by displacement, the stopper inserted containing a measured amount of the reagent of known strength, e. g., lead acetate for H_2S, and the bottle is well shaken. The contents are tested for H_2S by lead paper, and the process is repeated until the lead solution is no longer blackened. From the amount of lead solution used, the amount of H_2S present may be calculated. For carbonic acid, baryta water is used in the stopper, the barium carbonate being filtered off and weighed. For ammonia, the Nessler reagent is used if the amount is small. If large, it must be estimated by alkalimetry.

The Cooper process consists in mixing 2½ parts of slaked lime with 100 of the coal, and charging this into the retorts.

The advantages claimed are: 1st, a large yield in ammonia; 2d, a slight increase in the amount of gas; 3d, a marked diminution in the amount of sulphur in the gas.

With a coal containing 1.7 per cent· sulphur, gas has been made by this process, containing 3 grains S per 100 feet, while the purifiers last for a very long time.

In the discussion which followed it was suggested that some kinds of coal were more suitable than others as regards mixing with the lime, or as regards the amount of ashs and sulphur in the coke. The loss of the sale of spent oxide (£4,000 for 1883 at the Manchester Corporation Works) was mentioned as an objection to the process.

As to the objectional nature of sulphur in the gas, opinions differed. It was claimed by one speaker that the use of the lime lowered the temperature of the retorts to such an extent that less gas was obtained. E. W.

Newcastle Section—General Meeting.

International Methods of Sampling and Testing. J. Pattinson. (P. 17.)

A review of the points suggested at the meeting of the London Section. The author suggests that adopting certain methods of analysis would limit original research as to methods. The establishment of some sort of a court of appeal was also suggested.

In the discussion, attention was called to discrepancies in results on soda, phosphoric acid in fertilizers, tannins and acetic acid. The resolution proposed in the London Section was finally passed.

E. W.

A Review of the Present Methods of Preparing Hydrobromic Acid, and a Description of a Process for Preparing it from Bromide of Tinc. and Sulphuric Acid. A. Sommer. (P. 20).

The methods recommended are classified as follows:

1st. Direct combination of Br and H, with the agency of heat, contact with red-hot Pt, as wire, sponge or tube, red-hot, porcelain tube or electric spark. These methods are troublesome, but are preferable where a pure, anhydrous acid is desired.

2. Decomposition of hydrogen compounds by Br, H_2S in aqueous solution of Br, H_2S in CS_2 solution of Br, Br with paraffin at 185°C, Br with sulphites or thio-sulphates. These methods are wasteful in material. The Br is largely retained in the residues.

3d. Decomposition of compounds Br with solid metalloids by the action of water,—sulphur bromide, antimony bromide, phosphorus bromide. The latter method requires considerable care to avoid explosion in forming the PBr_5. The author describes a method which he has found safe and profitable. It consists in allowing the Br to drop gradually from a stopcock funnel upon a mass of phosphorus under water, which is kept cold. The liquid is drained from the phosphorus, H_2S passed through it to separate the As (an inevitable impurity in commercial phosphorus) and the liquid is distilled. The HBr should not be allowed to come in contact with organic substances.

4th. Decomposition of metallic bromides by acids. Sulphuric, phosphoric and tartaric acids have been used. With tartaric acid there is loss of material. Phosphoric acid is costly. Sulphuric acid, with some bromides, liberates Br and SO_2 which contaminates the product, if the acid is above a certain strength. So far as $ZnBr_2$ is concerned, it has been found that any acid containing under 80 per cent. H_2SO_4 can be safely used. $BaBr_2$, made either by forming NH_4 Br and decomposing by Ba CO_3, or by the reaction of Ba S and Br distilled with H_2SO_4, gives a good product, though the process is somewhat lengthy. KBr with H_2SO_4 is expensive. The author's process is minutely described. It consists in forming a $ZnBr_2$ solution by the action of Br on metallic zinc. in presence of water, the mixture being kept cold,—evaporating the solution to dryness and heating until the edges begin to fuse. A retort is then charged in the proportions of 1 mol $ZnBr_2$, 10 mol. H_2O and 2 mol. H_2SO_4 and the acid distilled off. The distillate invariably contains H_2SO_4, and Ba Br_2 or Ba (HO_2) in sufficient amount to saturate all the H_2SO_4 must be added, and a second distillation made. E. W.

Converting Sulphides into Sulphates by Means of Nitric and Hydrobromic Acids. (P. 23.) A. Sommer.

After digesting with fuming nitric acid, until the acid ceases to act energetically, small portions of hydrobromic acid are added. E. W.

Bulletin de la Société Chimique de Paris. (Vol. XLI. No. 1. Jan. 5th, 1884).

Remarks on Thermochemical results. M. BERTHELOT. (P. 4). An attack on Mr. Thomsen's work on Thermochemistry. E. W.

Researches on Nitrogen Iodide. A. GUYARD. (P. 12).

The nitrogen iodide, obtained by the action of aqueous ammonia on iodine, is decomposed by light, with effervescence of nitrogen. The violet rays have the least effect, and is greatest in the yellow rays. In pure water the action begins at first with effervescence followed by a volent explosion. In ammonia, of 22° B, it effervesces steadily without explosion. The rapidity of decomposition is proportional to the intensity of the light. The iodide forms with equal facility in light or in darkness, but in the light it forms faster than it decomposes. It is proposed to measure the intensity of light by measuring the nitrogen evolved, when iodine and ammonia of 22° B are allowed to act upon one another. Half of the iodine used always goes to form ammonium iodide. Equations, illustrating the action of formation, decomposition in the light, etc., are given. E. W.

Researches on the Double Iodide of Copper and Nitrogen. A. GUYARD. (P. 16).

A tolerably concentrated solution of an alkaline biniodide, when added to an ammoniacal solution of copper, affords a crystalline precipitate of a violet garnet shade, consisting of a combination of NH_2I with Cu I. The compound is stable when dry or in its mother liquor, but is decomposed by water and liquid ammonia. E. W.

Action of Iodine on Potassium Seleniocyanate. A. VERNEUIL. (P. 18).

A concentrated solution, composed of 93 parts I, 120 parts KI, and 100 parts water, when run, drop by drop, into a 10 per cent. solution of potassium seleniocyanate, clouds, turns red, and finally deposits red crystals. On analysis, these crystals were found to contain iodine, which the author believes to be due to an impurity in the state of cyanogen iodide.

The true composition is believed to be $C_6\ N_3\ KSe_3\ 2HO$. (Old system).

The substance has an unpleasant odor of both hydrocyanic acid and seleniuretted hydrogen. It is decomposed by water or by heat-

ing to 120°. Insoluble in ether, chloroform and CS_2. With absolute alcohol it decomposes, depositing selenium, and affording a brown substance soluble in alcohol, $C_6N_3KSe_6$, having the same properties of decomposability and solubility, as the first mentioned compound. E. W.

On the Emetics of Mucic and Saccharic Acid. D. KLEIN. (P. 20).

By introducing antimonious acid into a boiling solution of sodium bimucate, a compound analogous to sodium tartar emetic is produced, the tartaric acid being replaced by mucic acid. The analysis of the compound and some of its properties are given. The acid saccharates appear to form similar compounds, but as yet no crystallizable compounds had been obtained. E. W.

Determination of Tannin Contained in Vegetable Substances, Principally in the Bark of Oak, Birch, Fir Quebracho, Cinchona, etc. M. PERRET. (P. 22).

For this method are used: 1, a solution of egg albumen, containing 20 grms. in 100 cc. of water (unfiltered). 2. A solution containing 10 grms. dry aluminium sulphate in 100 cc. of water (unfiltered).

For the process, 20 grms. of the bark to be analyzed is extracted with water by two boilings of 15 minutes each. The liquors are united and evaporated to 100 cc. This is then cooled to 70°, and the albumen solution added little by little, so long as a precipitate forms, the solution being constantly agitated. The solution is brought to a boil, and the moment it boils the aluminium sulphate solution is added from a burette, the solution being briskly agitated. The addition of the aluminium sulphate is kept up until the precipitate becomes granular and compact and separates from the solution. It is then cooled, filtered through a weighed filter, washed with hot water and dried until it ceases to lose weight. From the weight of the filter and precipitate is deducted that of the filter, that of the albumen, and that of the aluminum sulphate. The remainder represents the tannin in the sample. The author finds, by experience, that whatever the combinations into which the sulphuric acid of the aluminum sulphate may enter, the weight of the precipitate is increased by an amount exactly equal to the weight of that of sulphuric acid, and, therefore, the entire weight of the aluminium sulphate is to be deducted. E. W.

Session of the Society of Dec. 28th, 1883.

M. Manumené spoke of the synthetical formation of Cu_2S, by pressure, and of the formation of Cu_5O_3, by heat, as confirmation of his theories advanced on the subject.

As regards the apparent variations in the atomic weight of carbon spoken of by M. Schutzenberger, the speaker attributed them to slight experimental errors.

M. Longuinine communicated results of experiments on the calorific powers of isomeric and homologous actions and others. The two isomeric acetones gave essentially the same amounts of heat, with homologous acetones the addition of each CH_2 caused an increase of about 158,000 calones. The difference in amount of heat developed by the diethylic and dimethylic ethers of carbonic acid was somewhat less than is usual between homologues.

M. Guntz had measured the heat of neutralization of alkaline and alkaline earthy hydrates by H F. The heat developed is something less than that for the chlorides.

MM. Oechsner and Essner had oxidized the beta-lutidine derivation of brucine. On treating the resulting liquid with cupric acetate a compound yielding an acid with the properties of nicotianic acid, another compound containing an acid which yielded pyridine by distillation over lime, and cupric formiate and aceto-formiate.

M. Oechsner had attempted to hydrogenize beta-lutidine, but thus far without success, in obtaining a stable hydride. He also described some of the properties of the lutidine from coal tar, which is peculiar in being soluble in water in all proportions.

M. Lemoine spoke of the hydrocarbons and higher alcohols contained in petroleum, describing octyl, nonyl and decyl hydrides and their derivatives, specimens of some of which were exhibited.

J. H. S., jr.

Experiments on the Combustion of the Diamond. C. FRIEDEL. (P. 100.)

The oxygen used was made from $KClO_3$, and carefully purified. The combustion was effected in porcelain tubes, as the Bohemian glass was found to be too fusible.

After setting up the apparatus, experiments in blank were first made. In the unsuccessful experiments with Bohemian glass tubes

it was observed that the diamonds did not coke, but presented a dull, partially corroded surface. The results were as follows:

Diamond taken.	Ash.	Co_2 obtained.	at wt C.
0.4705 gms.	0.0007 gms.	1.7208	12.017
0.8621 "	0.0005 "	3.1577	12.007

In the above Cape diamonds were used. Some magnetic and some crystalline particles were found in the ash. Some Brazil diamonds were found to contain black carbonaceous particles. J. H. S., jr.

Response to the Reclamation of MM. C. Vincent and Delachanal. F. Sestini. (P. 104.)

With regard to priority in methods of preparing sulpho carbonates. J. H. S., jr.

On a Fraud in Tartar Emetics. J. Castelliaz. (P 106.)

The potassio-antimonic oxalate is frequently offered instead of the tartrate. The former contains 23.67 per cent. antimony oxide as against 43.7 per cent. in the genuine article. The fraud may be detected by dissolving in water, adding acetic acid, and then calcium chloride solution. The oxalate gives an immediate precipitate, while the tartrate gives none. The detection of sodium phosphate, which is sometimes fraudulently added, is more difficult. J. H. S., jr.

On the formation of Acetylene at the expense of Iodoform. P. Cazeneuve. (P. 106.)

Silver, mercury, copper, iron and zinc, or mixtures of them, in a fine state of division, as well as nascent hydrogen, when brought in contact with iodoform in presence of moisture, give rise to the formation of iodides and acetylene, even in the cold, though the action is more rapid if the mixture be heated. Beside the acetylene, two other compounds are formed, the one a gas with a fœtid odor, the other a very dense liquid containing iodine, but having the odor of chloroform. J. H. S., jr.

Heat of Neutralization of the Alkaline and Alkaline Earth Bases by Hydrofluoric Acid. M. Guntz. (P. 110.)

The heat of neutralization is somewhat less than for the corresponding chlorine compounds. The list of formation of hydrofluoric acid is probably less than 32.9 cal. J. H. S., jr.

Note on the Observations of M. Spring. E. JANNETTAZ. (P. 114.)

The author denies first, that pressure determines crystallization, and, second, that pressure determines combination.

Schistosity, and not chrystallinity, appear to result from pressure, and the small amount of combination detected in mixtures of sulphur with various metals after subjection to pressure, is attributed to the heat developed. J. H. S., jr.

Note on the Development of Schistocity in Compressed Bodies. ED. JANNETTAZ.

Resumé of some experiments undertaken to combat the views advanced by Mr. Spring. J. H. S., jr.

On the Second Anhydride of Mannite. A. FANCONNIER.

The method of preparing this body is described in detail. It has the formula $C_6 H_{10} O_4$, is slightly deliquescent, and dextrorotatory. Being isomeric, with the mannide described by Berthelot, the author names it *isomannide.*

The method of preparation and elementary analyses of several derivatives are given.

Action of Cyanogen on the Toluidines. J. A. BLADIN. (P. 125.)

The preparation, salts, and some derivatives of cyanogen compounds of para and metatoluidine are described. J. H. S., jr.

Zeitschrift f. Anal. Chem. 1884.

On the Estimation of Phenole, in Creosote Oil. BY DR. KLEINERT. (P. 1.)

The author, after collecting the oil, proceeded as follows :

1 part of the acid oil was shaken up with 30 times its weight of warm water, and placed aside to settle.

The oil not dissolved was freed from water, and submitted to fractional distillation. Up to 180° C. a few turbid drops of liquid had distilled over. The receiver was now changed. The temperature rose to 208°, and then slowly to 215°. The distillation was not continued above this, as the author only wished to know if the acid oils contained, besides phenole, any other compound of the same, or nearly the same boiling point, which would behave in contact with bromine in the same manner as carbolic acid. But as the existence of such a body is hardly to be expected, it now becomes necessary to study the properties of the other higher-boiling oils in relation to bromine.

500 g. of crude oil was submitted to fractional distillation.

At first, by low temperature, a little water passed over. The temperature then rose to 180°, and up to this point only a little oil had distilled over.

The temperature was then raised to 190°, and a small amount of oil, free from water, passed over. At 210° the oil distilled more freely. At 212°, white fumes of low tension passed over, and from 218°—222° the temperature rose very slowly.

The temperature then rose slowly to 250°, 260°, and 265°, and only a few oily drops passed over, which partially solidified in the neck of the retort and receiver to a mass of the consistency of butter.

The distillation was stopped at 270°, and the distillate placed for three days in a cool room, during which time its yellow color changed to reddish brown, and deposited a solid, yellowish body. Previously the specific gravity of the liquid at 13°, was found to 1.007.

The solid body was separated from the fluid, washed with alcohol, dissolved in petroleum ether, and allowed to evaporate slowly. Strongly lustrous crystals were obtained, which were washed with alcohol and dried. From its melting point and boiling point it was found to be naphthaline.

The dark red liquid was shaken up with 300 c. c. caustic soda solution of 1.25 Baumé, and placed aside to settle. It separated after a while in two layers. The top one, of the same color as the distillate, was clear, and amounted to 130 c. c. The lower one was brown, and amounted to 270 c. c.

After the neutral oils had been separated, the caustic soda was decomposed with muriatic acid, and the acid oils precipitated, after being freed from salt, were submitted to fractional distillation.

At 100°. Water passed over.
At 110°. White vapors appeared, a milky fluid passed over, and the thermometer rose slowly
to 120°. The vapors ceased to appear at 115°, and the thermometer rose rapidly
to 170°. Here the receiver was changed. The temperature then rose to 190°.
At 190°. Only a little oil had passed over.
At 195°. White vapors appeared again, and the temperature rose slowly.
At 198°. The thermometer remained stationary for a while, and then rose very slowly to 199°, 200°, 203°, 205°, and from there it rose more rapidly to 220°.
At 230°. A dark yellow oil began to pass over.
At 240°, 250°. Only a few drops passed over.
At 260°. Only a very little distilled over.
At 265°. The retort became filled with yellow fumes, and as only a small residue was left in the retort, the distillation was stopped.

All that had distilled up to 170 was allowed to rest, and separated

into two layers, the lower one being oily, while the upper one was watery.

The oil was examined for carbolic acid, as follows :

(a) With piece of pine wood ; turned light blue.
(b) With chloride of lime solution ; weak reaction.
(c) With ferric chloride ; violet-colored solution.
(d) With bromine water ; slight turbidity.

The distillate of the acid oils, which had been distilled from 170°—265°, was redistilled. The following fractions separated, and as before, were tested for carbolic acid:

170°—200°	(a)	Light blue coloration.
	(b)	Plainly visible blue solution.
	(c)	Violet solution, changing color.
	(d)	Turbidity and precipitation.
200°—220°	(a)	Yellow, with blue coloration above wetted surface.
	(b)	Light bluish solution.
	(c)	Violet solution, soon decomposing.
	(d)	A much more pronounced white precipitate.
220°—230°	(a)	Slightly blue above wetted surface.
	(b)	On adding ammonia, white precipitate soluble in water, and giving a yellow solution with chloride of lime.
	(c)	Violet solution.
	(d)	Heavy white precipitate.

In all the three portions, sub. a, b, c, the presence of phenole is verified.

The neutral oils which separated from the distillate, after treating with caustic soda solution, were likewise submitted to fractional distillation.

At 110° a few drops passed over, the temperature then rose to 150°, and the liquid began to boil, after which the temperature rose rapidly to 170°, 180°, 190°, and a large amount of oil distilled over. At 200° the receiver was changed. From 208° the temperature rose slowly to 215°, remained stationery for a short time, and finally rose to 250°. The distillation was stopped here, and the two fractions were treated, (a) with chloride of lime, (b) with ferric chloride, (c) with bromine water.

I.	150—200° (5 c. c.)	(a)	Below blue and above red.
		(b)	. . . . .
		(c)	Turbidity.
II.	200—250° (75 c. c.)	(a)	Bluish, above orange.
		(b)	. . . . .
		(c)	Turbidity.
III.	200—250°	(39 c. c.)	
		(a)	Below reddish, above slightly blue.
		(b)	On adding ammonia, reddish solution.
			On adding chloride of lime, greenish, then yellow, and at last loss of color.

(c.) Violet, soon losing color.
(d) Heavy white precipitate.

IV. 250°—290° (7 c. c.)
(a) Yellowish.
(b) Ammonia added to dilute solution produced a reddish color.
(d) Much heavier white precipitate.

The author, after numerous other experiments, came to the following conclusions:

(1) All distillations furnish between 150° and 200°, the smallest distilates.
(2) It is not to be surmised that in liquids distilling at a temperature of 200° we should meet with carbolic acid, as the latter boils at 184°—185°, but strange to say, the fractions obtained between 200°—250° are really the richest in carbolic acid.
(3) The acid oils contain bodies boiling above 250° which behave like phenole in contact with bromine.

If, therefore, we estimate the phenole in a sample of creosote oil, according to Koppeschaar's method, we do not get the largest yield from the phenole itself, but from other bodies contained in the oil, which are soluble in water, and have higher boiling points.

J. H. S., Jr.

A few remarks on the practicability of Schlösing's Ammonia-Estimation Process for Plant Extracts. By E. Shulze. (P. 13.)

The author states that the presence of glutamine and asparagine materially affects the correctness of Schlösing's method, but that with proper precautions, the method may be employed.

Thus, if it is desired to make an ammonia estimation of a plant extract containing asparagine, and we change the standard acid, standing over the extract after a period of 48 hours, and titrate back, the error will be only a small one, even if a considerable amount of asparagine be present.

Suppose, for example, that the substance under examination should contain 0.20 per cent. N, in form of ammonia, and 10 per cent. of asparagine, we would probably find 0.22 per cent. nitrogen, as ammonia, provided the asparagine in the extract does not undergo a heavier decomposition than in pure solutions.

After various other remarks on this subject, the author concludes that, with proper care, the ammonia in extracts containing asparagine may be nearly all absorbed by the standard acid after the lapse of about 48 hours. J. H. S., Jr.

On the Estimation of Organic Matter, According to Methods Depending on the Reduction of Potassium Permanganate. By Dr. A. R. Leeds. (P. 17.)

The author found, after numerous experiments, that the methods

of Forchhammer, Kubel-Tiemann, and Schulze-Trommsdorff, are liable to error, and that it was better to operate at nearly a boiling temperature, which he obtained by placing the flask containing the water in a water-bath which heated contents to 99° C. The heating was maintained for ten minutes.

He also found that the results thus obtained agree with those depending on the reduction of silver nitrate to metallic silver in the presence of organic matter. J. H. S., JR.

On a Method for the Precipitation and Quantitative Estimation of Digitaline, Digitaleine, and Digitine. BY R. PALM. (P. 22.)

The author proceeds as follows :

The coarsely powdered herb is thoroughly extracted with water, and the extract filtered through bone black till nearly colorless, and the filtrate treated with lead acetate till complete precipitation ensues. The precipitate is collected on a filter, and the filtrate is treated with lead acetate and alcoholic ammonia, (12 parts lead acetate and one part Liquor Dzondii), till no further precipitation occurs. This last precipitate is composed of lead oxide and the glucoside of digitalis. After washing, it is collected on a filter and rubbed up with water to the consistency of a thin paste. It is then decomposed by treating with sulphuretted hydrogen. The precipitate is collected on a filter. The aqueous filtrate contains all the digitaleine, while digitaline and digitine remain on the filter with the lead sulphide. By treating the lead precipitate with chloroform, and evaporating the extract, digitaline may be obtained in a crystalline form. Lastly, by extracting the lead precipitate with alcohol, and evaporating the latter, digitine is left behind in a pure condition.

The property of digitaline, to be precipitated with lead acetate and alcoholic ammonia, is of great use in detecting it in poisoning cases, as the process is applicable to even very small quantities, it being completely precipitated.

In poisoning cases, the lead precipitates of these three poisonous glucosides may at once be distinguished from one another by the following reactions :

1. The precipitate of picrotoxine is more slimy, and turns saffron-yellow when treated with strong sulphuric acid.

2. The precipitate of digitaline is gelatinous, and turns flesh colored when treated with sulphuric acid.

3. The lead precipitate of solanine is sandy, and turns dark fawn color when treated with sulphuric acid. By adding to the mixture a little sugar it turns first violet, and then blue. J. H. S., JR.

Chemisches Central-Blatt. 1884.

On a Few Physical Properties of Chemical Compounds. F. NIEMÖLLER. (P. 1.)

The author finds that the refracting index n, and the gravity d, of all gases, change with the atmospheric pressure and temperature, in such a manner, that the quotient $B = \frac{n-1}{d}$ remains constant.

This quotient, which he calls the "specific refracting property" of the substance, depends solely upon the chemical nature of the gas.

Accurate experiments on a series of liquid bodies, also proved that the quotient B, stands likewise in relation with pressure and temperature. Thus Landolt observed that, in ethyl alcohol B, at 12° C, has the value 0.4426, while at 28° C it has the value 0.4423. He is, therefore, lead to believe that B, in liquid chemical compounds, depends principally upon their constitution.

Numerous experiments lead to the following laws :

(1.) "Isomeric substances have the same specific refracting indices."

(2.) "That physical mixtures have the same indices as chemical compounds of the the same percentage composition."

(3.) "That the molecular structure is without influence on the size of the molecular refraction."

"The molecular refraction of a molecule is the sum of the atomic refractions of the molecule. Each atom exercises, in each molecule, a similar influence."

J. H. S., Jr.

Formulæ, to estimate the proportion in which two solutions of known per centage should be mixed, in order to obtain another solution of the desired per centage. BY R. RIETH. (P. 54.)

As an example, the author gives the following figures :

Suppose, that 2grm. hydrochloric acid require for neutralization 12.5 c.c. normal, KOH solution, and that another 2grm. of a different acid, should require 16.8 c.c. The relation between them may be expressed as follows :

TOO DILUTE.	REQUIRED STRENGTH.	TOO CONCENT.
12.5	13.7	16.8
	DIF. 1.2	DIF. 3.1

Now as it is necessary to take more of the third, the weaker the first; or more of the first, the stronger the third, 3.1 dilute acid + 1.2 pts. concentrated acid must be taken in order to obtain 4.3 pts. acid of the desired strength.

These proportions are best calculated to an even number, or say, 1,000 c.c.

We therefore get the following equation :

$$4.3 : 3.1 = 1{,}000 : x$$

$$x = 720.93 \text{ cc. dilute acid.}$$

According to the same rule ; the amonnt of concentrated acid is 279.07 c.c. By mixing the two acids, 1 lit. acid of the required strength (25%) is obtained.

J. H. S., Jr.

Journal of the London Chemical Society.

On the Estimation of Starch. C. O'Sullivan. No. CCLIV. (P. 1.)

The process, as applied to the cereals, involves the treatment of the flour with ether to remove fat, with alcohol of .90 specific gravity, to remove sugars, albuminoids other than casein, etc., and with water at 35°–38° C to remove amylans, etc. These solvents are without action on starch.

Purified starch is then converted by specially prepared diastase into maltose and dextrin, which are the sole products, and the residue after this action of diastase is shown to be free from starch. Maltose and dextrin are then determined in the solution by the saccharimeter. Malted grains yield maltose to the alcoholic extract among the other sugars, but dextrin is not present in either alcoholic or aqueous extract. Raw grains, of *average ripeness*, yield neither soluble starch nor either of its decomposition-products to the aqueous solution. The errors of the process lie within 0.5 %

A. A. B.

On the Oxidation of Phosphorus at a Low Temperature and the alleged Decomposition of Phosphorous Anhydride by Sunlight. R. Cowper and V. B. Lewes. No. CCLIV. (P. 10.)

Detailing the results obtained by passing of air over fused phosphorus and the exposure of the product to sunlight. The deposit

obtained in the tube is shown to be a mixture of phosphoric and phosphorous anhydrides with pure phosphorus in crystals, the latter becoming amorphous phosphorus when exposed to sunlight.

A. A. B.

On the Constitution of the Fulminates. E. DIVERS and H. KAWAKITA. No. CCLIV. (P. 13.)

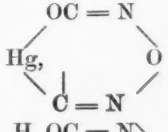
The authors, acting on Steiner's recommendation of mercury fulminate as a source of pure hydroxylammonium chloride for which one of them had need, were led into an investigation of the fulminates. Fuming hydrochloric acid, acting on dry fulminate, yields almost the theoretical proportion of hydroxylamine, accompanied by formic acid into which all carbon of the fulminates is converted. *Dilute* acid yields also a trace of HCN. No oxalic acid results from action of acids upon fulminates, although carbonic acid is set free when sulphuric acid is used.

A. A. B.

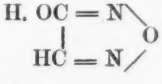
Theory of the Constitution of the Fulminates. E. DIVERS No. CCLIV. (P. 19.)

The fulminates being known to contain two isonitrosyl radicals or their equivalents, and two formic carbons, the author discusses the earlier formulæ given by Berzelius, Kekulé, Armstrong, and Steiner and advances the hypothesis that the fulminates are formed (1) from an alcoholic residue in which hydrogen has been replaced by a metal, and which retains only C and O, and (2) a condensed hydroxylamine residue. After discussing the formula of hydroxylamine which is regarded as *amidogen oxide* $(NH_2)_2O$ the author deduces the following formulæ :

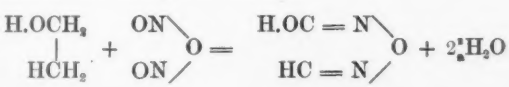
Mercury fulminate,



Fulminic acid



The latter is formed by the reaction.



Nitrate of silver or mercury is necessary to fix the spontaneously decomposable fulminic acid as it is formed. A. A. B.

Note on the Formation and on the Constitution of the Fulminates. H. E. Armstrong. No. CCLIV. (P. 25.)

A criticism upon the last paper. Nitrous *acid*, not nitrous *anhydride*, is concerned in the reaction. The assumption of Divers that the CH_3 group exchanges 2 H for N.OH is unwarranted. The alcohol in formation of fulminic acid undergoes successive *hydroxylation*, in accordance with a known reaction, and *hydroxethaldehydrol*, CH_2 (OH), CH $(OH)_2$, is formed. This compound the author regards as the primary source of the fulminate, "*which is formed from it by simultaneous, or it may be consecutive, action of nitrous acid and hydroxylamine.*

Fulminic acid is written

$$\begin{matrix} ON.C.OH \\ \diagdown C\ (NH) \end{matrix}$$

A. A. B.

On Liebig's Production of Fulminating Silver without the use of Nitric Acid. E. Divers and M. Kawakita. No. CCLIV. (P. 27.)

The statement of Liebig (*Ann. Pharm.* 5, 287) that fulminating silver separates when nitrous acid is passed into an alcoholic solution of silver nitrate is incorrect. The needle-like crystals described by Liebig, were found to be silver nitrate. Neither under the conditions described, nor by the use of *silver nitrite*, could the fulminate be obtained. The essential condition seems to be a vigorous oxidation of alcohol by nitric acid in presence of either mercury or silver nitrate.

Attempts were made to obtain copper fulminate but without success. The result is ascribed to "the active catalytic oxidizing power of cupric salts, which affects the action of nitric acid upon copper (Acworth and Armstrong) and so readily causes the destruction of hydroxylamine (or isonitrosyl hydride) is sufficient to explain the failure." A. A. B.

The Illuminating Power of Ethylene when burnt with Non-Luminous, Combustible Gases. Percy F. Frankland. No. CCLIV. (P. 30).

The author refers to the similar investigation of Frankland and Thorne, relating to the luminosity of benzol (Chem. Soc. J. 33, 89). His results are summarized as follows.

1. That pure ethylene, when burnt at the rate of 5 cubic feet per hour from a Referee's argand burner, emits a light of 68.5 standard candles.

2. That the illuminating power of equal volumes of mixtures of ethylene with either hydrogen, carbonic oxide or marsh gas, is less than that of pure ethylene.

3. That when the proportion of ethylene in such mixtures is above 60 per cent. the illuminating power of the mixture is but slightly affected by the nature of the diluent. When, on the other hand, the proportion of ethylene in such mixtures is low, the illuminating power of the mixture is considerably the highest when marsh gas is the diluent, and the lowest when the ethylene is mixed with carbonic oxide.

4. That if 5 cubic feet of ethylene be uniformly consumed, irrespectively of the composition of the mixture, the calculated illuminating power is in every case equal to or actually greater than that of pure ethylene, until a certain degree of dilution is attained. This intrinsic luminosity of ethylene remains almost constant when the latter is diluted with carbonic oxide, until the ethylene forms only forty per cent. of the mixture after which it rapidly diminishes to zero, when the ethylene forms only 20 per cent. of the mixture. When the ethylene is diluted with hydrogen, its intrinsic luminosity rises to 81 candles when the ethylene constitutes 30 per cent. of the mixture, after which it rapidly falls to zero when the ethylene amounts to only 10 per cent. In the case of mixtures of ethylene and marsh gas, the intrinsic luminosity of the former is augmented with increasing rapidity as the proportion of marsh gas rises, the intrinsic luminosity of ethylene, in a mixture containing 10 per cent. of the latter, being between 170 and 180 candles.

A. A. B.

Chemical News. Vol. 49.

Notes on the separation of Selenium and Tellurium from each other and their preparation from Lead-chamber deposit. Masachika Shimosé. P. 26.

On the Determination of the Number of Atoms in a Molecule. C. A. Seyler. P. 31.

For determination of molecular weight where the method by vapor density is inapplicable and in bodies comparatively free from crystalline structure, which tends to produce abnormal changes

of volume in solidifying, the following rule is given: "The difference between the real density just before and just after fusion, divided by the experimental latent heat gives the number of atoms in the molecule."

"Real density" is defined as a value depending upon intermolecular distance and is obtained by dividing the relative weight (Sp. gr.) referred to hydrogen, by the molecular weight of the body or where this is unknown by the atomic weight, assuming that the molecule in this case has but one atom. Latent heat of fusion of mercury, calculated as above, is 2.7; the experimental value of Person is 2.8.

The author concludes that "real density" is proportionate to absolute temperature and suggests that the density of liquids at their boiling points should be proportionate to latent heat of condensation. A. A. B.

The Molecular Volume of Salt Solutions. W. W. J. Nicol. P. 37.

Attempts to establish a connection between the composition of a salt and its molecular volume, analogous to the law of Kopp for organic liquids, have been but partially succesful. The state of molecular aggregation and the magnitude of intermolecular spaces are comparable only in salts which are strictly isomorphous. When salts are dissolved in water, however, the molecular interspaces are approximately coextensive. The author considers this conclusion, reached in a former paper, to be now established by recent work of Groshaus (*Wiedermann's Ann.* Nov., 1883) and Bender (*Ib.* Dec., 1883) and announces the following law: "In diluted solutions (1 equivalent to 200 H_2O) the volume of a metal in a salt is independent of the salt-radical with which it may be combined" and *vice versa*. He finds by experiment that the volume-change on double decomposition attended by precipitation is constant in reactions between $BaCl_2$ or $Ba(NO_3)_2$ and Na_2SO_4 or K_2SO_4 and hopes, by a continuation of his experiments, to be able to recognize water of constitution of a salt in solution. A. A. B.

Determination of the At. wt. of Oxygen. T. Hilditch. P. 37.

Discusses the methods of preparing hydrogen in which have been used in determinations of the At. wt. of O by the CuO process, and the subsequent manipulation, indicating possible errors.

A. A. B.

On the use of Litmus, Rosolic Acid, Methyl-orange, Phenacetolin and Phenolphthalein as Indicators. R. T. THOMSON. P. 32 and p. 38.

Continuation of previous experiments. A comprehensive summary of the work is given in a table showing the behavior of these indicators in titration of a great variety of compounds.

Estimation of Cl. Br. and I. in presence of one another. F. MAXWELL-LYTE. P. 55.

All of the halogens are precipitated as silver salts, weighed, dissolved in very dilute solution of KCN treated with a weight of KBr equal to that of the precipitate, and then with excess of delute H_2SO_4. The precipitate is collected and weighed, dissolved again and treated as before, using one and a quarter times its weight of KI instead of KBr, dried and weighed again. The second precipitate contains all silver as bromide except what was bromide or iodide already, and the third all silver as iodide except what had previously been iodide. A. A. B.

Rapid Filtration. B. F. DAVENPORT. P. 57.

In a note to the Editor the author describes an apparatus for pressure-filtration, in which the funnel is covered by a thick sheet of rubber weighted down by a heavy plate of glass. The filter is supported by a perforated cone, as usual, and pressure upon the surface of the liquid is supplied by a Fletcher's foot-blower, which forces air into an opening made through both plates. A. A. B.

American Patents.

CONDENSED FROM THE OFFICIAL GAZETTE OF THE U. S. PATENT OFFICE, BY O. H. KRAUSE.

January 1, 1884.

291,142.—Base for paints.—A. E. Brockett.

Made of pine tar or Stocklolm tar, caoutchouc gum, gutta percha, gum shellac, gum copal or copal (oil) varnish, and linseed oil.

291,163.—Manufacture of ferrocyanides.—G. de Vigne.

Coal gas, or other gas or smoke, containing cyanogen or hydrocyanic acid is deprived of its tarry products and subjected to the action of a mixture of iron, in any of its various forms, and an alkaline salt.

291,167.—Process of purifying water for boiler use.—C. B. Dudley.

Consists in treating the water with caustic baryta, in addition to soda lime, the whole process being in one operation.

291,168.—Method of purifying water for boiler use.—C. B. Dudley.

Consists in treating the water, first with caustic baryta, and then with carbonate of soda, the whole process being in one operation.

291,175.—Extracting naphtha from oil.—I. W. Evans.

Heats the oil to the desired temperature, then admits live steam to drive off the naphtha in the form of vapor.

291,264.—Process of obtaining ammonia from furnace gases.—J. and J. Addie.

Consists in first fixing the ammonia in such gases after they leave the furnace by mixing them with sulphurous acid or sulphuric acid, in the form of gas or vapor, and then condensing or dissolving the salts or compounds thereby formed.

291,298.—Retort deoxidizing furnace.—I. D. Condit, Jr.

Not intelligible without the drawing.

291,302.—Preparation of glue stock from bones, etc.—E. F. Crusé.

Adds calcium carbonate to the mother-liquid resulting from the treatment of bones, etc., with hydrochloric acid in the manufacture of glue, then adds calcium hydrate to precipitate organic matter and separates the clear calcium chloride from the precipitated impurities. The calcium chloride is then decomposed by means of sulphuric acid and the resulting hydrochloric acid used over again after the calcium sulphate has been filtered off.

291,329.—Manufacture of Soap.—W. E. Gibbs and C. G. Otis.

The mixture of alkali and fat is passed forcibly through a heated channel filled with small particles of iron or other substance.

291,386.—Gas furnace for metallurgic and other purposes, and method of perating the same.—J. F. Morgan and H. F. Hayden.

The method for controlling and varying the character of the flame in metallurgic and like furnaces, which consists in first bringing together the proper volumes of air and gas to produce complete combustion at the point of initial combustion, and then surcharging the flame with oxidizing or carburizing gases between the point of initial combustion and the working chamber of the furnace.

291,410.—Blast furnace for zinc ores.—A. M. G. Sébillot.

A blast furnace combined with an upper and lower outlet-pipe, of which the former is connected with a condensing chamber, and the latter is connected with a condenser formed of pipes and a metal collecting chamber, which pipe condenser is connected with a condensing chamber.

291,417.—Process and apparatus for making coal gas.—A. Stamm.

The tarry vapors given off from fresh charges of bituminous coal in gas retorts, during the early part of the distillation, are converted into a fixed gas, by injecting such vapors by the combined action of a jet of gas under pressure, and a small jet of steam, into and through a mass of incandescent coke contained in a separate retort.

291,421.—Process of and apparatus for manufacturing gas.—J. L. Stewart.

Consists in generating a mixture of hydrogen and carbonic oxide, by decomposing steam in contact with incandescent fuel, cooling them and then forcing them by a pump into an injecting device, and thereby spraying a stream of hydrocarbon liquid into a heated vaporiser, and finally combining and fixing the resulting vapor and gases by passing them through heated retorts.

291,422.—Coke oven.—H. Stier.

A coke oven adapted for heating with gas, and arranged on the regenerative principle.

291,462.—Fume condensing attachment for ore furnaces.—E. M. Alderman.

The smoke stack of an ore furnace or smelter is connected with a large horizontal pipe, into which water can be sprayed for the purpose of condensing the fumes.

291,463.—Electric gas generator. C. E. Ball and C. S. Bradford, Jr.

Consists in generating hydrocarbon gas in an electrical generator, and hydrogen gas in another electrical generator and mingling said gases.

January 8, 1884.

291,565.—Process of making syrup and sugar from sorghum cane. A. J. Adamson.

Proposes to first roast the cane and then to express the juice.

291,641.—Process of obtaining aluminium. F. J. Seymour.

Claims to obtain an alloy of zinc and aluminium by mixing aluminous ore or earth with an ore of zinc and with carbonaceous material and a flux and subjecting the mixture to heat in a close retort.

291,632.—Method of and apparatus for refrigerating paraffine and other oils. B. F. Shakespeare.

Consists in bringing together the oil and a refrigerating liquid both in a spray or comminuted condition.

291,670.—Process of and apparatus for obtaining gold and silver from their ores by combined electrolytic and amalgamating processes. M. Body.

Subjects gold and silver ores to the action of ferric salts, in combination with the electrolytic process and subsequently amalgamates the metals with mercury under the continued action of the electric current.

291,676.—Apparatus for carbureting air. W. F. Burrows.

A combination of mechanical arrangements for effecting the above purpose.

291,677.—Paint. A. Buzolich and T. K. Smith.

Composed of the following harmonious ingredients: Linseed or nut oil, hydrochloric acid, phosphoric acid, shellac, resin, chromate of potash, beeswax and garlic.

291,678.—Paint. A. Buzolich.

A paint composition, the basis whereof is linseed, or nut oil, combined with chrysophanic acid, sulphates of zinc and copper, and chromate of potash.

291,734.—Artificial stone. W. Howell.

Muriatic acid, flowers of sulphur, molasses, iron scale, sand and cement.

291,784.—Tawing hides and skins. A. Schultz.

Consists in subjecting them to the action of a solution of potassium bichromate and then treating the same with a compound containing hydrosulphurous acid.

291.785.—Tawing hides and skins.—A. Schultz.

Consists in subjecting them to the action of a bath prepared from a metallic salt—such as potassium bichromate—and then to the action of a bath capable of evolving sulphurous acid.

291,821.—Process of concentrating sulphuric acid.—M. A. Walsh.

Concentrates in the usual way until the acid contains about 93% of monohydrated acid, and then completes the concentration in iron or steel vessels.

291,830.—Hydrocarbon furnace.—R. B. Avery.

Fed by hydrocarbon vapors and gas evolved from the oil by means of superheated steam.

January 15, 1884.

291,860.—Apparatus for the manufacture and delivery of illuminating gas.—W. H. Adams.

Manufactures carbonic oxide with or without the addition of steam and hydrocarbons, by forcing a controllable supply of air to the producers and thence to the service mains.

291,948.—Gas generator.—D. M. Small.

Apparatus for enriching air or combustible gases with hydrocarbons.

291,953.—Depilating hides and skins.—A. H. Stone.

Sulphide of sodium in combination with pure sulphur and carbon.

291,993.—Apparatus for recovering soda used in manufacture of paper pulp.—E. W. Dixon.

Relates to an apparatus for concentrating dilute solutions.

292,020 and **292,021.**—Mode of utilizing discarded rubber belting and rubber hose.—F. A. Magowan.

292,054.—Apparatus for making sulphuric acid.—J. S. Rigby.

The combination of the kiln or burner, the nitre oven, its pans, a sulphuric acid heating cistern, a vessel provided with an indicator and serving to contain nitrate of soda in solution and pipes for supplying the solution and sulphuric acid to the pans.

292,078.—Glover's tower. M. A. Walsh.

Claim 3. A Glover's tower, the walls and arch of which are composed of courses of cut quartz, said arch being corbeled out by overhanging arches, and formed with openings for the descent of acid from an upper chamber and the ascent of gases admitted through a lateral opening near the base of the tower, substantially as shown and described.

292,081 and **292,082.**—Apparatus for making gas.—A. Wilson.

A gas producer with central rotating tuyere, liquid seal and provided with means for automatically removing incombustible refuse.

292,100.—Process of and apparatus for mixing and cooling sugar.—M. C. Cogswell.

A combination of mechanical arrangements for finely dividing the sugar and bringing it into contact with air.

292,119.—Process of making white lead.—I. K. Kessler.

Electrolyses an alkaline acetate in solution, using lead for both the anode and cathode, whereby acetate of lead and solution of caustic alkali is formed. These are subsequently mixed, forming hydrated oxide of lead and regenerating the alkaline acetate. By passing carbonic acid gas into this solution, the suspended oxide is converted into carbonate.

292,125.—Manufacture of vinegar.—V. Michaelis.

Describes a method for conducting the ordinary process of acetification with greater rapidity.

ESTABLISHED 1851.

General Laboratory Supplies,

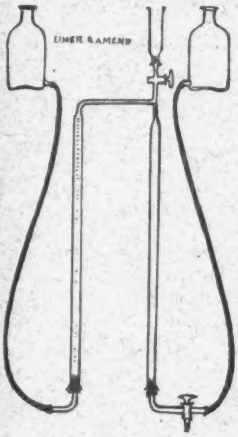
EIMER & AMEND,

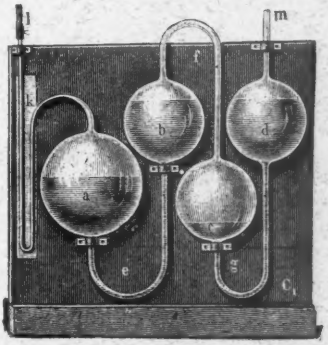
Nos. 205, 207, 209 & 211 Third Ave., cor. 18th St.,

NEW YORK,

Importers and Manufacturers of

Chemicals and Chemical Apparatus





Chemically Pure Chemicals of Merck, Trommsdorff & Schuchardt.

ACIDS.

PURE HAMMERED PLATINUM WARE,

Best Bohemian and German Glassware,

Royal Berlin and Meissen Porcelain Goods,

Analytical Balances and Weights.

Sole Agents for

Schleicher & Schull's Celebrated Filter Papers, Scheibler's Polariscopes, & Jolly's Balances.

Also a full line of Supplies for

ASSAYERS AND SUGAR CHEMISTS.

Glassblowing and Engraving done on the Premises.

EIMER & AMEND.

Illustrated Catalogues Sent on Application.

W. PICKHARDT & KUTTROFF,

IMPORTERS OF

ARTIFICIAL DYE-STUFFS, &C.,

98 LIBERTY STREET,

NEW YORK.

BRANCHES:

BOSTON—43 KILBY ST.

PHILADELPHIA—30 NORTH FRONT ST.

ARTIFICIAL ALIZARIN (patented).

ARTIFICIAL INDIGO (patented).

ANILIN DYES, AZO DYES.

RESORCIN DYES.

CHEMICAL APPARATUS.

REAGENTS.

We have the finest Apparatus and purest Reagents that care and skill can select or money can buy. A personal call or a trial order is solicited.

RICHARDS & CO.,

398 BOWERY, OPP. 6TH STREET,

NEW YORK.